Jetstream-31 (J31) Flight Report for INTEX-ITCT
Flight 11 - 20 July 2004

Radiation legs over stratus near Ron Brown with Terra overpass in MISR local mode swath. AOD profiles over stratus. Brief AOD near surface in very small clear area at Terra overpass time.

Overview

This was the fifth J31 flight out of Pease. Goals, focused on Terra overpass of 1143 EDT (1543 UT) and MISR local mode, were:

1. Find clear area within MISR local mode swath if possible. If so, fly leg near surface at Terra overpass, with profile before and/or after.
2. If no clear area, fly radiation legs over stratus, over Ron Brown if possible. Fly AOD profile above stratus

J31, its instruments, and communication with the Ron Brown all performed well. However, after the flight we noticed brief excursions in AATS detector temperature, apparently correlated with our marine band radio transmissions.

Flight Path, Timing, and Measurements

Flight path is shown in Figure 1 below. Engines on at ~1026 EDT. Takeoff at 1047 EDT. Engines off at 1241 EDT.

We climbed out on a 'ramp-ascent' to ~5.5 km (Figure 2 below). We found fairly uniform stratus over the Ron Brown and a very small clear area nearby. Ron Brown reported it was in dense fog. We profiled down to near stratus top (~800 m) and flew a leg above the stratus, which appeared fairly uniform. At Terra overpass time (1543 UT) we had descended to ~60 m ASL in a small clearing. Low cloud/fog puffs caused us to park AATS briefly. We flew another leg above the stratus at ~800 m, then profiled up to ~4.4 km and flew another radiation leg above the stratus. In the first leg at ~800 m, AOD(500 nm) varied strongly. In the second it was more constant, ~0.26, with small-amplitude waves. AOD(500 nm) at 4.4 km was about 0.025. On landing at Pease, AOD(500 nm) was ~0.4.

An example of SSFR-measured spectral irradiance and albedo above cloud is shown in Figure 3 below. The plotted spectra represent a 5 minute average at around 1600 UTC, after the Terra overpass and after the J-31 ascended through the aerosol layer above cloud top. Shown along with the measured albedo (ratio of upwelling- to downwelling irradiance) spectrum is a model calculation representing the best fit to the measurements. In another attached figure the contours of residual (an RMS measurement-model difference at selected wavelengths) between measurement and model illustrate a well-defined minimum, of magnitude around the uncertainty of the measurements, and indicating a cloud of optical thickness 10 and effective radius in the range of 8-12 micrometers.

Instrument Performance
Radar Altimeter: Matches pressure altitude well. Rock solid, even thru clouds.
Position and Orientation System (POS): Operated by Jim Eilers since Bob Billings had returned to Ames. Position accuracy from 6 to <1 m throughout flight. Frequent jumps between limits.

Nav/Met: Data displayed by AATS looked good. No data dropouts.

SSFR: Was always working. See measurement description for science accomplishments.

AATS: Tracking well. Needed to set time on startup.

Notes, Insights
J31 crew and scientists were not clear on go-no go, so fueling was delayed.

After door closing, needed 24 minutes to takeoff.

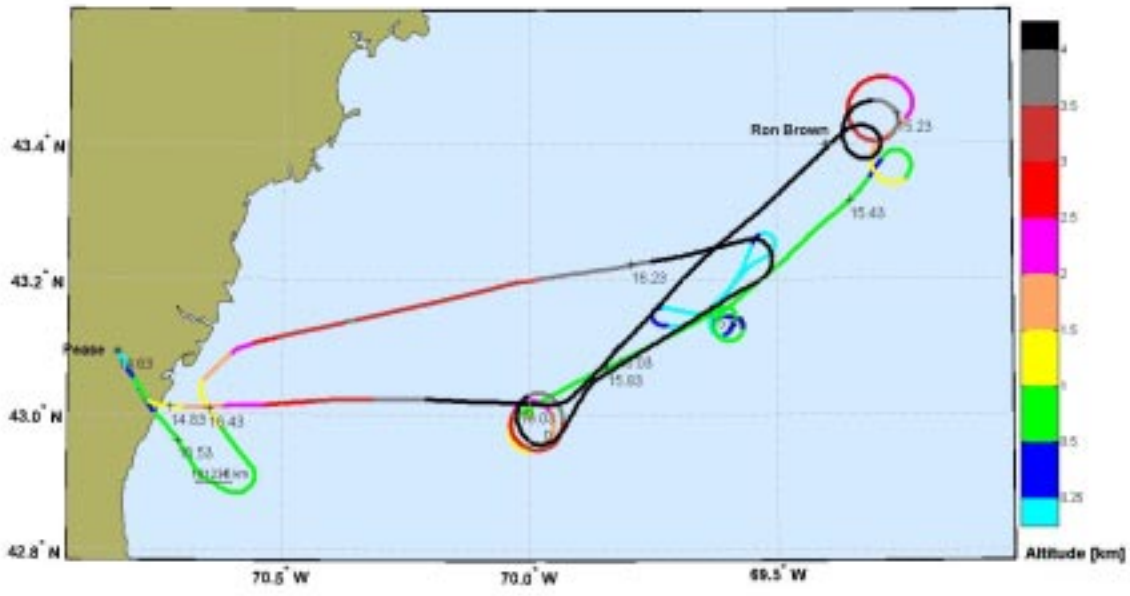

Figure 1. Flight track of J-31, Flight 11, July 20, 2004.

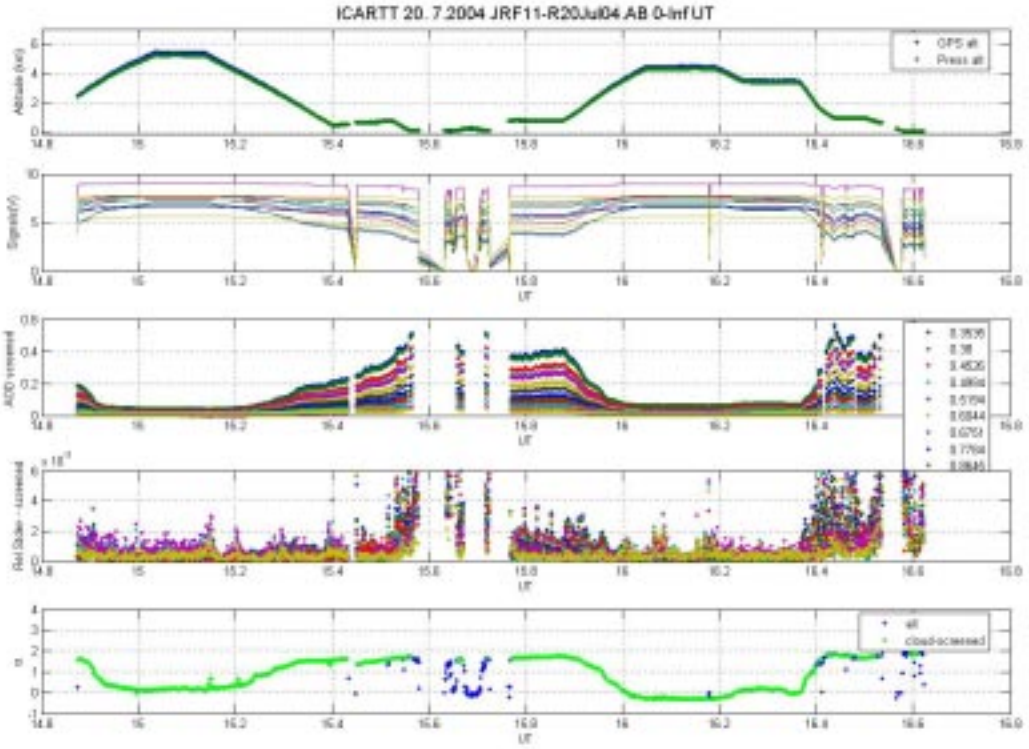

Figure 2. Time series of flight altitude, AATS-14 signals, derived aerosol optical depths, standard deviation of signals, and modified Ångstrom exponent for J-31, Flight 11, July 20, 2004.

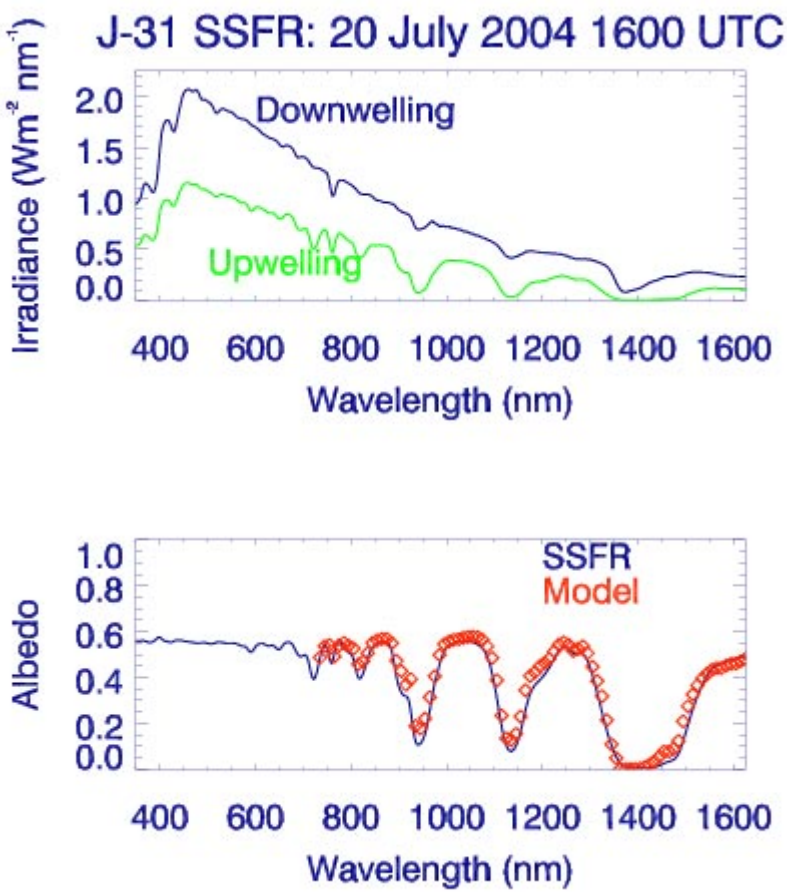

Figure 3. An example of measured spectral irradiance and albedo above cloud from Flight 11. The plotted spectra represent a 5 minute average at around 1600 UTC, after the Terra overpass and after the J-31 ascended through the aerosol layer above cloud top. Shown along with the measured albedo (ratio of upwelling- to downwelling irradiance) spectrum is a model calculation representing the best fit to the measurements.

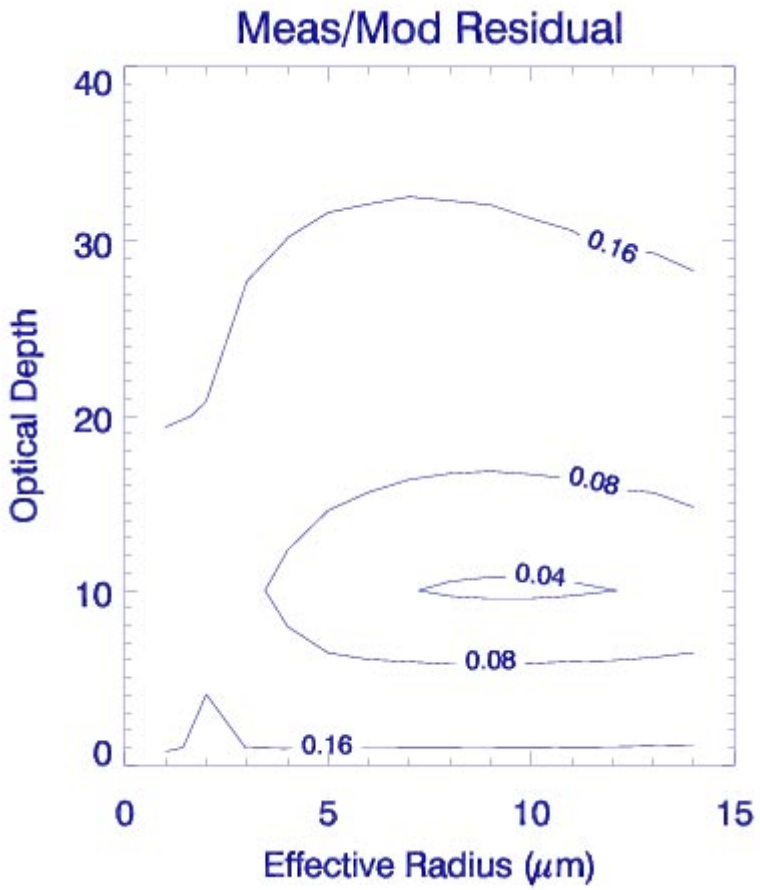

Figure 4. Contours of residual between SSFR measurement and model albedo in Figure 3. Minimum residual indicates a cloud of optical thickness 10 and effective radius in the range of 8-12 microns.